Terra Cotta Construction

How Terra Cotta Was Put on the A. I. U. Tower

By J. HOWARD JACOBSON '31

Many people, unless connected directly with the building construction industry, cannot explain or even formulate an idea of what Terra Cotta is. The writer, therefore, feels that a brief discussion on the manufacture of this material will be an aid to the understanding of this subject.

Terra Cotta is a clay product used mostly for the exterior finish of a building, but it may be used for interior ornamental work as well. Since this discussion is limited to exterior construction, it is evident that after the architect had made his drawings, the steel construction plans were drafted before those of the Terra Cotta. When this essential step had been taken, the Terra Cotta draftsmen fitted the Terra Cotta piece by piece to the steel until the citadel stood completed, as far as planning was concerned. It was from these last plans that the moulds were carved, and the clay shaped; then it was dried, enameled, and baked. On removal from the kilns, the edges of the pieces, which could then be called Terra Cotta, were ground down, squared up, and holes for the anchor iron drilled in. The pieces were then laid down upon the floor in their respective positions, and numbered to correspond with the blue prints. Several months of moulding, enameling, and baking were required to provide the vast amount of Terra Cotta for the A. I. U. It is obvious that not all this material could be manufactured at once. For this reason, two or three carloads a week were shipped to Columbus, which kept the men well supplied with material, and gave the factory sufficient time to manufacture the Terra Cotta properly. This method of receiving material, no doubt, would be expressed in slang, "as right hot from the ovens," which truly describes it.

As soon as the box cars had been placed in the railroad yard, a trucking company was engaged to haul the Terra Cotta to the A. I. U. (Four thousand nine hundred and fifty-six truckloads of Terra Cotta were needed to make the A. I. U. the Queen of Citadels.) When a loaded truck came to a stop before the building, the laborers swarmed about it, quickly relieving it of its burden, like Arab Thieves would attack a caravan. The cries and yells of men calling the floor numbers and set letters, filled the air. It is a wonder in such confusion that the Terra Cotta was properly and correctly stacked. The box car emptied, attention was quickly centered on placing the Terra Cotta on the proper floors. Sweating men, loaded and pushed the "barrows" for the cage (a flat single platform elevator) which lifted them and their burden to the proper floor, where another "gang" of men quickly unloaded them and stacked the pieces. Terra Cotta stored this way was easily accessible as the construction advanced story by story.

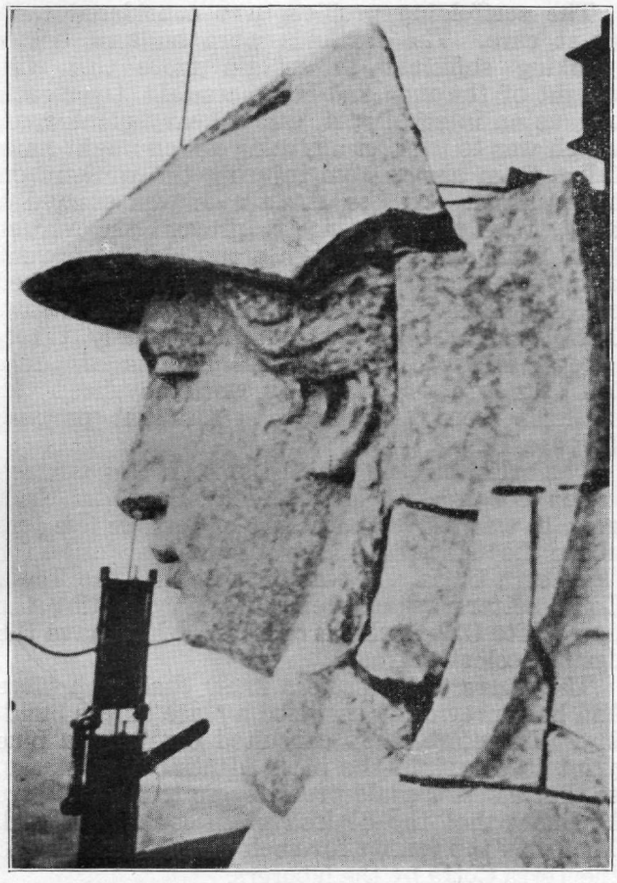

Fig. 1. Note the 'Jack' in the lower left hand corner; the large black joints are those made of Vulcatex.

Now that the Terra Cotta has been considered, it is time to discuss briefly the auxiliary material used in the actual construction.

Mortar was a requisite in the Terra Cotta construction of the A. I. U. There were two kinds used: The first, with Carney Cement as its base, in the proportion of one part of cement to three parts of sand; the second, with lime as its base, in the proportion of one part of lime to four parts of sand. In each case, sufficient water was added to bring the mixtures to a working consistency.

Of equal importance was the anchor iron, which was used to hook the Terra Cotta to the steel skeleton. It is a pure iron rod one-quarter of an inch square, which was cut, bent, and twisted, as needed, into the desired shapes. This iron was processed with Udylite, which is an alloy of Cadmium, known as Ferro-Cadmium, and which rendered the iron impervious to rust, corrosion, and electrolytic action.

Since the Terra Cotta, as shipped, was hollow, to facilitate handling and setting, bricks were used to fill the void, or "back it up" as it is termed. Both hollow and solid bricks were used in order to

minimize the tremendous weight of this sky-scraper.

If some enamel was chipped off of a piece of Terra Cotta, and the chip was small, it could be patched with a special patching material, the formula of which is kept a secret. However, if the chip was large, the piece of Terra Cotta chipped was discarded, and a replacement made on the Queen of Citadels.

The scaffolding problem was considered with great care. The scaffolds were built of heavy planking sufficient to sustain more than the weight of the men and the material. Over each one, as an integral part, was a heavy plank roof, which was to prevent anything which might have fallen from above from injuring the workers on the scaffold. On the street side was erected a heavy wire netting fence to prevent the worker from falling to a sure death, and also to prevent a tool or a piece of Terra Cotta from being nicked off, and injuring someone in the street below. This structure was suspended by many three-quarter inch cables from I-beams, approximately ten stories above. As the work advanced the scaffolds were raised by jacks for that purpose (Figure 1).

The artistic touch which the A. I. U. possesses is due to a proper color contrast. Beautiful black granite was set to the height of four or five feet above the sidewalk. This was the foundation for the Terra Cotta. It was on this that the Terra Cotta setters began their duties, by setting the fine White Oak Bark Terra Cotta, which gave the desired color contrast.

The Terra Cotta setters knew that each piece had been previously assigned a place on the building. Therefore, they consulted carefully a blue print to ascertain the piece identification marks, so that a setter could promptly go to a pile where he knew that the desired piece could be found. That was the reason for such careful stacking of the Terra Cotta by the laborers.

Though the Terra Cotta had been painstakingly squared up at the factory, each setter gave each piece a trial setting. A settlement of the building or a "fire twist" from burning, might cause a piece not to set perfectly true. This would throw not only that one piece out of plumb, but also all others around it. The first step in this experimental setting was to set the piece in position, and check it carefully. If the piece was true there was nothing left to this setting, but the fitting of the anchor iron. Let us, however, assume that the piece did not set squarely in its place, and therefore an uneven joint resulted. The checking showed that the lower right edge was higher than the upper right edge. The error was estimated, and the high part carefully chiseled down to the correct level as estimated. The piece then fit quite accurately.

The anchor iron could then be fitted. A length of iron was taken and an angle bent on one end, slightly less than a right angle. This angle was slipped through a hole in the piece of Terra Cotta, and the remainder of the rod carried back toward the steel. At the point where the iron could be fastened to the steel, giving the greatest support, a mark was made, and the rod removed from the Terra Cotta. Three or four inches beyond this point, the iron was cut, on a small anvil, and a right angle made at the mark, in the desired direction. Three or four pieces were fashioned in this same manner.

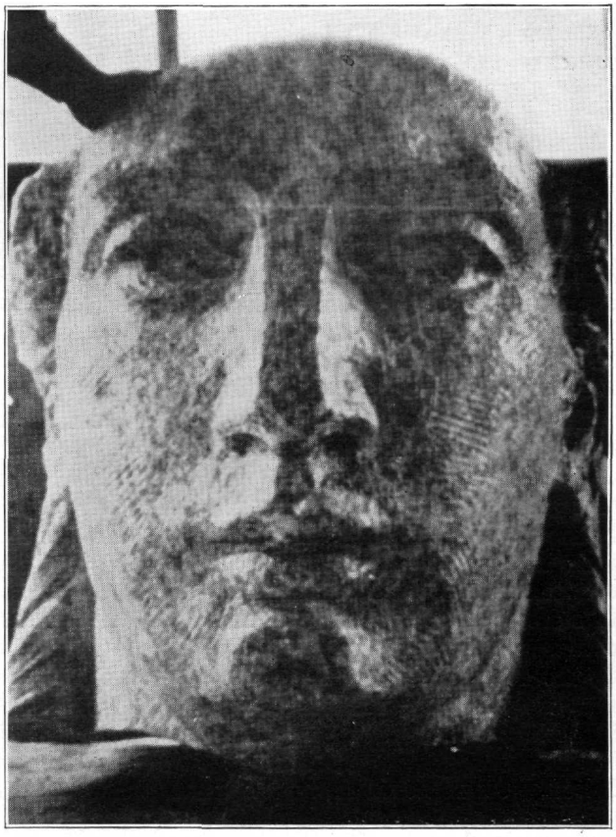

Fig. 2. Note the size of the head. It comes very close to a six-foot man's hips.

All steps had been taken to insure an accurate permanent setting, and so the procedure was begun at once.

Since the piece referred to was being set on the granite, (the method would be the same for a piece being set on a piece) two or three trowels of mortar were smeared on the upper edge of the granite. The two sides of the piece of Terra Cotta were also covered with mortar. The piece was again set in place, and joint-width wedges inserted. This was a precaution taken to prevent the mortar from being squeezed out by the weight of the Terra Cotta, which would give too thin a joint. The anchor iron was then hooked to the steel, and when by means of plum rule the piece was found level, the right angles on the ends of the rods were bent double against the steel and Terra Cotta. About five or six pieces were set in this manner on top of each other, but that was the limit until these pieces were backed up with brick. The Terra Cotta, being hollow, would break with so great a weight upon it, if it were not for this backing up. Mortar was thrown in the hollow part of the Terra Cotta; then bricks covered with mortar were set in until the pieces were full. An interior brick wall was then built right up against the back of the Terra Cotta, adhering to it by means of mortar. Overall, this made a very strong piece of masonry.

There are very few buildings in the world, which

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have so much artistic work on their exteriors, and which involved such heavy pieces, as the A. I. U. Citadel.

A little difference in procedure was encountered when such a piece as the angel's head (Figures 1 and 2) was set, although the general method was identical. This head, from the center of the neck to the center of the forehead, weighed nearly eight hundred pounds. It was evident that one or two or even three setters could not handle this without the aid of some device which aided human muscle. A block and tackle was suspended from a point above which the piece was to be placed. The ropes were securely fastened to the head, and the piece swung out into the air. It was carefully lowered into position, and found to be quite accurate and ready for the final setting. Had it been found otherwise, the high parts would have been chiseled off as before. The anchor iron was fitted as above, but total reliance was not placed in it. Very long three-quarter-inch iron bolts, processed with Udylite, had been previously prepared to support this great weight. The head was again lifted into the air while mortar was smeared on the top of the lower half of the neck. Some Vulcatex (a tar product) was put with this mortar to allow for expansion and contraction. The piece was then lowered and set identically as before. The backing up was the same except that it was done on a larger scale. Wheelbarrow loads of mortar and brick were dumped into the hollow portion of the head, which made the head a solid piece upon the hardening of the mortar.

After the pieces had become set, the joints were finished off. The wedges were removed, and mortar, the color of the Terra Cotta, was applied with a small trowel. Skilful workers accomplished this pointing up rapidly, leaving a smooth joint which was a little lower in the center than at the edges.

Any pieces that had a tiny chip were patched. The patching was applied with a small trowel, and when it became dry an observer, even with care, could not detect the patched place.

Innumerable hand marks, thumb prints, and clinging surplus mortars were on the beautiful structure when the Terra Cotta setting was completed. There remained, then, the last big task of washing. This was done with a solution of Muriatic Acid, one volume of the acid to two volumes of water. The solution was put in a wooden bucket to prevent the chemical action which would have occurred had it been put in a metal container.

The washing was accomplished by starting at the top and working down. Scrub brushes were industriously applied. The action of the acid in combination with the scraping effect of the brushes soon removed all the dirt. Immediately following this, the Terra Cotta was rinsed with cold water, and the structure stood gleaming in the sun—completed.

The beautiful citadel, which now adorns the city of Columbus, is sturdier than the Parthenon of old. The steel, the Terra Cotta, and the bricks are not individual parts, but one piece, forming a monument to fine arts in the industrial world.